

Department of Commerce and Labor

BUREAU OF STANDARDS

Washington

BUREAU CIRCULAR No. 11
5TH EDITION*

November 1, 1909.

Under the provisions of the act of Congress establishing the Bureau of Standards, the Bureau is authorized, among other things, to determine "physical constants and the properties of materials, when such data are of great importance to scientific or manufacturing interests."

For several years the American Foundrymen's Association had charge of the preparation, analysis, and distribution of certain samples of iron for use in checking analytical results. By an agreement with that association in 1905 the samples were transferred to the Bureau of Standards, which institution has since then attended to their distribution and will endeavor to replace them with new samples as occasion demands. With the cooperation of the American Association of Steel Manufacturers, the Bureau is also issuing samples of analyzed steel.

Samples of the following irons and steels are now ready for distribution:

Pig iron (Sample D).—The silicon, phosphorus, and manganese in the iron are high.

Bessemer steel (samples of approximately 0.1, 0.2, 0.4 per cent carbon).

Basic open-hearth steel (samples with 0.1, 0.2, 0.6, 0.8, and 1.0 per cent carbon).

Acid open-hearth steel (samples with 0.1, 0.2, 0.4, 0.6 per cent carbon).

The following samples are in course of preparation:

Pig iron (Sample B).—Renewal. The silicon and phosphorus in this iron are low.

Pig iron (Sample C).—Renewal. The silicon and phosphorus in this iron are medium.

Bessemer steel (samples with 0.6 and 0.8 per cent carbon).

Acid open-hearth steel (samples with 0.8 and 1.0 per cent carbon).

A few of the more important alloy steels will be prepared in the near future.

Detailed certificates of analysis will be sent with samples ordered. Summary analyses are given in this circular on page 2.

Descriptive circular No. 14, giving the Bureau's methods of analysis, will be sent to those ordering samples.

This circular will be revised from time to time and a copy of each new edition will be sent to all who have ordered samples within twelve months.

When new samples are issued, announcement will be made in the following journals: *Iron Age*, *Journal of Engineering and Industrial Chemistry*, *Electrochemical and Metallurgical Industry*.

Each sample weighs 150 grams and is contained in a glass bottle with metal screw cap. Orders for from one to three samples are filled by mail, each bottle being shipped in a separate mailing case.

Lots of more than three are sent by express, charges collect.

* Superseding the fourth edition, issued March 25, 1909.

Averaged analyses—Irons.

SAMPLE.	Total carbon.	Graphite.	Combined carbon.	Silicon.	Titanium.	Phosphorus gravimetric.	Phosphorus perman- ganate titration.	Phosphorus alkali titration.	Sulphur by oxidation.	Sulphur by evolution.	Manganese.
B-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
C-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
D-----	2.89	2.25	0.64	2.64	0.133	0.601	0.602	0.603	0.035	0.027	1.41

Averaged analyses—Steels.

KIND OF SAMPLE WITH APPROXIMATE CARBON CONTENT.	CARBON.			Silicon.	Phosphorus.	SULPHUR.		Manganese.
	Direct combustion.	Solution and combustion.	Colorimet- ric.			By oxidation.	Evolved as hydrogen sulphide.	
BESSEMER.								
0.1 -----	0.080	0.072	0.075	0.005	0.112	0.078	0.080	0.513
0.2 -----	0.207	0.200	0.180	0.023	0.112	0.082	0.084	0.890
0.4 -----	0.448	0.459	0.450	0.087	0.102	0.069	0.066	0.916
0.6 -----	-----	-----	-----	-----	-----	-----	-----	-----
0.8 -----	-----	-----	-----	-----	-----	-----	-----	-----
BASIC OPEN-HEARTH.								
0.1 -----	0.144	0.136	0.130	0.013	0.031	0.035	0.036	0.528
0.2 -----	0.241	0.242	0.248	0.009	0.019	0.019	0.022	0.464
0.4 -----	-----	-----	-----	-----	-----	-----	-----	-----
0.6 -----	0.611	0.605	0.567	0.007	0.037	0.028	0.028	0.568
0.8 -----	0.837	0.836	0.807	0.011	0.025	0.021	0.025	0.654
1.0 -----	1.049	1.054	1.100	1.153	0.045	0.027	0.028	0.405
ACID OPEN-HEARTH.								
0.1 -----	0.101	0.104	0.097	0.016	0.056	0.057	0.057	0.412
0.2 -----	0.207	0.208	0.205	0.033	0.093	0.095	0.091	0.760
0.4 -----	0.378	0.376	0.390	0.059	0.031	0.044	0.044	0.486
0.6 -----	0.591	0.592	0.590	0.081	0.025	0.050	0.049	0.559
0.8 -----	-----	-----	-----	-----	-----	-----	-----	-----
1.0 -----	-----	-----	-----	-----	-----	-----	-----	-----

USE OF THE SAMPLES.

Great pains have been taken to make the contents of all the bottles uniform, and the agreement of the analyses indicates that these efforts have been successful. In shipping, however, the fine and coarse particles in the bottles become segregated so that it is of the greatest importance that the contents of each bottle be thoroughly mixed again before any is used for analysis. Each bottle of iron will be labeled with its letter only, and each bottle of steel with its approximate percentage of carbon, but gummed labels containing the average of the analyses by the different chemists will be furnished with each sample, and also certificates giving the complete analysis of each chemist, as it is believed that many will desire to know how close an agreement has been secured in these analyses. Owing to the dependence of the colorimetric method on identical heat treatment and composition of sample and standard, and the difficulty of securing these conditions in practice, the steels are not recommended for this method.

FEES.

The following schedule of fees has been adopted for samples of the same or different irons or steels:

SCHEDULE 101.—*Samples of Analyzed Irons and Steels.*

(a) Single samples, of 150 grams, each sample	\$2.00
(b) Three or more samples, each	1.70

Orders for samples should be accompanied by a remittance, which may be by check, draft, or post-office order, and should be made payable to the Bureau of Standards.

S. W. STRATTON,
Director.

Approved:

CHARLES NAGEL,
Secretary.



